A08826

A GUIDE FOR AGING DUCK BROODS IN THE FIELD

J. B. Gollop, Canadian Wildlife Service,
And
W. H. Marshall, University of Minnesota,
For
Mississippi Flyway Council Technical Section

(An extra sheet with Tables I to III & Fig. I has been printed on heavy paper and inserted in this booklet for field use.)

May 1954

A GUIDE FOR AGING DUCK BROODS IN THE FIELD

Waterfowl management relies heavily on production data. Whether the objective is precise production measurements to evaluate population mechanics or production trend measurements as a basis for sound regulations, the brood is the focal point at present. Waterfowl technicians involved in brood studies have for several years recognized the need for a brood age classification system which would lend uniformity to their reporting. In 1937, J. H. Stoudt used three plumage classes in his work (7). In 1950, U.S.F.W.S. personnel devised and used six plumage classes in their breeding ground surveys. However, little was known about the ages involved in either case. L. H. Blankenship, in 1951, described plumage stages at weekly intervals for six species of dabblers based on field observations of wild, known-aged broods (1). C. D. Evans and K. E. Black added data on ages by plumage classes from 1950 to 1953. Southwick reported on studies of hand-reared birds (6). In May, 1953, the Mississippi Flyway Council's Technical Section provided the funds for a preliminary report on "Techniques For Brood Production Studies" (?). Additional information was obtained during the 1953 breeding season which made a revision advisable. The present authors have attempted to assemble the data currently available and the Technical Section has again financed the publication of this booklet and its distribution to waterfowl workers in the four flyways. Major contributions to this report have been made by Milton Weller who supplied information on the redhead and drew Figure 1, Alex Dzubin who provided the results of his canvasback study, and Dr. H. G. Wendall who presented development data on ring-necked and black ducks. To a large extent this edition relies on the foundation laid by L. H. Blankenship, C. D. Evans, M. H. Hammond and A. S. Hawkins in 1953.

The scope of this booklet differs somewhat from its predecessor; it attempts to deal only with the complexities of aging young by plumage classes and the use of age data in calculating production. If, after field use, improvements can be suggested, it will be appreciated if they are sent to W. H. Marshall, 300 Coffey Hall, University Farm, St. Paul 1, Minnesota.

Aging by Plumage Classes

Three plumage classes and seven subclasses, covering the period from hatching to flying, are briefly described in Table I and illustrated in semi-diagrammatic style in Fig. I. The table and the figure assume deliberate observation of a brood at 50 to 75 yards through 7x50 binoculars under excellent light and other climatic conditions. After one or several such observations, the technician should be in a position to make satisfactory determinations at less favorable times.

The plumage subclass descriptions have, therefore, been modified somewhat from the 1953 bulletin to conform to this concept. Also, to remove the anomaly that existed in describing Class III as "Fully Feathered" and yet using down as an important criterion, subclass IIIa has been designated as IIc. Since the recording of subclasses is not an end in itself but is simply a convenient means of noting approximate ages in the field for further calculations at a later date, and since the same age ranges for last year's IIIa now fit IIc, this reclassification would not seem to cause serious inconvenience or confusion. On the contrary, it clarifies the subclass grouping so that any duckling with both down and feathers visible in the field, varying from "First Feathers" to "Last Down", now belongs in Class II. Ducklings with no feathers visible belong to Class I and those with no down visible, yet flightless, are in Class III. The new designation does not remove the difficulty that formerly existed in trying to subdivide Class III based on down characters (as explained below). Production figures and hatching curves based on the subclass designations and accompanying tables in the 1953 booklet will be directly comparable, for practical purposes, with these same computations based on the revised data in the 1954 booklet.

The use of seven plumage stages has been retained because 1) generally, they are distinguishable under field conditions which, in other respects, are suitable for census work; 2) the elimination of duplicate counts is more positive with narrower time intervals, and 3) the data from closely aged broods are of greater value

for determining chronology and possibly environmental or other influences on production.

Figure I has been modified to fit Table I and also to present the initial plumage stage for each subclass. It is a compromise between precise redhead-canvasback data and less detailed information on dabblers.

Table II gives the approximate age spent in each plumage subclass by each of twelve species of ducks. It conforms as closely as possible with Table I based on available information and forms the basis for the midpoint ages by subclasses given in Table III. Most of these midpoint ages have been changed a little from those given last year because the plumage descriptions are now given for ideal conditions. These changes do not justify a reworking of previous data for direct comparison.

Table III also includes supplementary data on down and primaries breaking from sheaths. The use of down to separate subclasses IIc and III may be a doubtful procedure for field aging purposes. Rain and wind may influence the actual and apparent amount of down, and there is some indication that where broods use dense emergent vegetation the down may disappear earlier than in more open habitat. Because of the difficulty of using other criteria except in intensive studies, it is suggested that censuses be conducted often enough so that there will be little need to make use of IIc and III broods.

Banding crews attempting to age birds in the hand from the data given will realize that Ic, IIa and IIb birds may show more feathers than indicated, while IIc and III young will show more down when in the hand.

Rates of Plumage Development in Ducklings: In Table II the duration in days for each plumage subclass and the dividing age between any two is given as a clear-cut point; such, however, is not the case. The ages given are considered to be average and some variation may be expected. Hochbaum mentioned the possibility of different growth rates in different latitudes (4) and an example of accelerated plumage development is suggested for Alaska. In the northern part of the territory

U. C. Nelson found numbers of newly-hatched pintail broods appearing about four weeks before freeze-up, the inference being that the survival and maintenance of that population without recruitment required that the birds be flying in little more than half the time needed by South Dakota pintails. Hence it should be pointed out that most of the dabbling species and the lesser scaup data presented are based on South Dakota broods, canvasback and redhead data are from southwestern Manitoba, while black duck and ring-neck work was done in Maine.

The question of directly comparing data on plumage development rates of hand-reared and wild ducklings needs further study. A start may be made by comparing Southwick's data (6) on the approximate ages at which hand-reared birds enter subclass IIa with the available data on wild birds. The plumages of hand-reared mallards, baldpates, blue-winged teal, shovellers and ring-necked ducks develop more slowly although pintails, redheads and canvasbacks appear similar. A comparison of flight ages from Hochbaum (4) with data in this bulletin shows that hand-reared gadwalls, blue-winged teal, shovellers, redheads and canvasbacks are somewhat later, while pintails are earlier, and mallards are about the same. Some of this variation may be partly explained by differences of temperament between species under hatchery conditions and by differences in hatchery procedures.

Use of Age Data in Calculating Production

In order to calculate production for an area based on brood surveys, some of the requirements to be met are: 1) knowledge of the degree of accuracy for the census method; 2) coverage sufficiently frequent so that no broods will pass through the period from hatching to flying without having a chance to be counted; 3) elimination of duplicate counts from the data collected, and 4) determination of the average brood size by species, probably best done by using Class II broods since there is apparently little mortality between these and Class III broods (1 and 3) and probably less combining of broods at the earlier stage (5).

While this booklet is not primarily concerned with the accuracy of sampling, a brief discussion of one method is presented. In some areas, beatouts, as described in the 1953 bulletin (?), are considered to account for all broods present (for practical purposes). An area where this was not the case is reported by J. G. Bue who found on South Dakota stock ponds (with little emergent vegetation) that a two-man beatout resulted in a count of approximately half of the mallard and pintail broods and 85% of the blue-winged teal broods known to be present by practically complete and continuous observations.

The difficulty of checking the thoroughness of a beatout in some areas may be seen by the success of a banding crew in Saskatchewan. J. B. Gollop found evidence that not all of the young present on choked sloughs were seen after as many as three successive beatouts by two men and a dog plus a search of the surrounding upland. Another point brought out here is that, in areas where a large portion of the brood population is using such sloughs during a census period, a good dog is a necessity - and more than one beatout may be required to account for and age most of the broods present. The recording of only broody hens - even if there were one in evidence for each brood - should be kept at a minimum, because a broody hen has to be treated as an unaged brood and a high percentage of unaged broods for any species weakens the production data for that species.

The second stipulation, concerning the frequency of census, calls for a knowledge of the flight ages of species on the area. Available data are given in Table II. A census should be run before the first broods are flying and subsequent censuses should be geared to the most rapidly developing species involved. In many cases this will be teal and, assuming that all three species develop in about the same period, the interval between counts should not exceed five weeks - near the minimum flying age for blue-wings. To avoid the necessity of having to separate broods into subclasses IIc and III, the interval might better be shortened to four weeks or less. Two coverages would probably be minimum for any area. The decision as to whether or not a third coverage

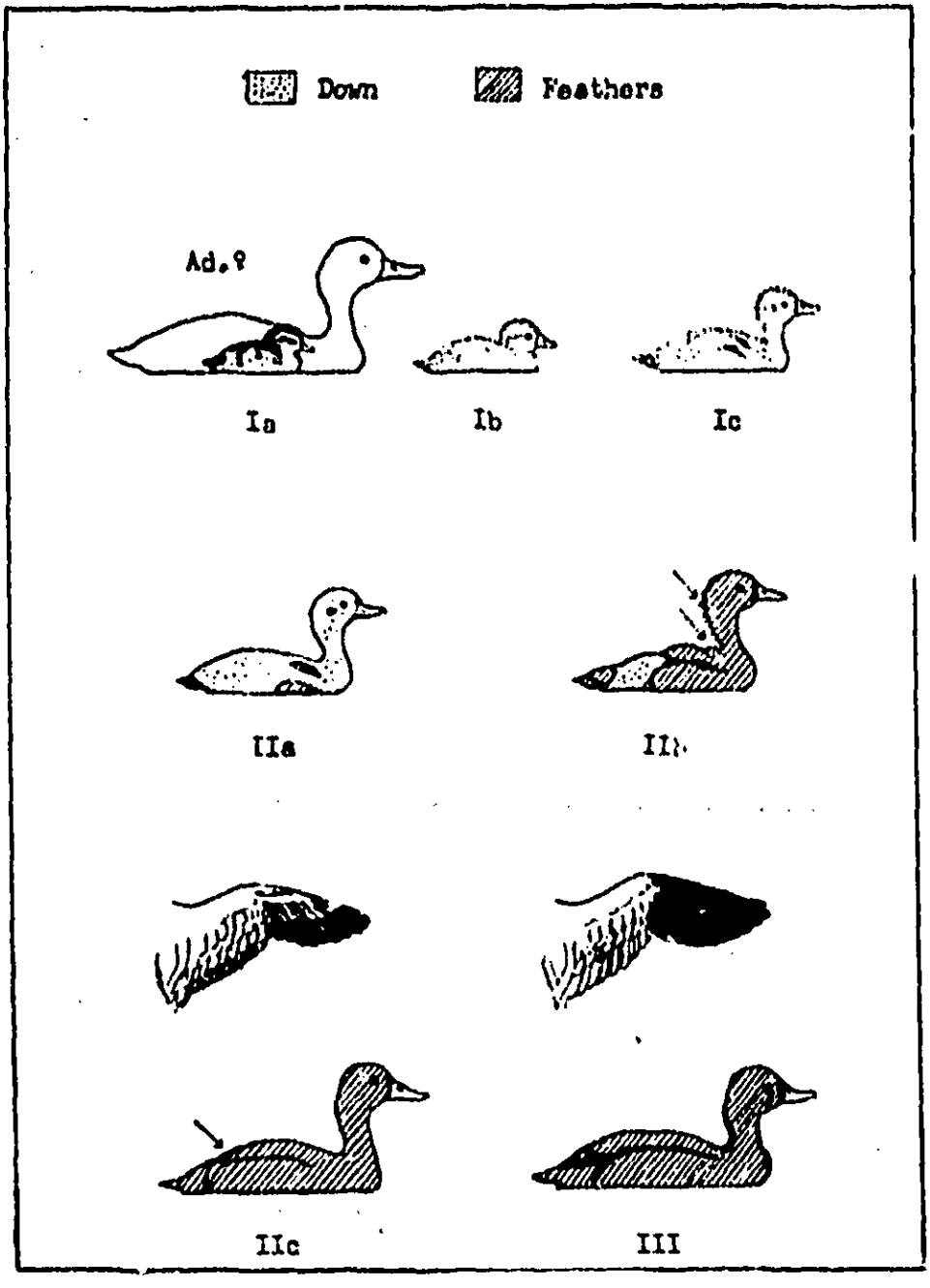
Plumage Class	
I	Downy Young No feathers visible
II	Partly Feathered as viewed from the side.
III	Fully Feathered in profile

Table I - Development of a Wild Duckling as Viewed Under Ideal Conditions

nage nan	Sub-Cla	Description
I	a	"Bright ball of fluff". Down bright. Patterns distinct (except diving ducks). Body rounded; neck and tail are not prominent.
ny ng 'o thers ible	b	"Fading ball of fluff". Down colour fading, patterns less distinct. Body still rounded; neck and tail are not yet prominent.
	c	"Gawky-downy". Down colour and patterns faded. Neck and tail becomes prominent. Body itself becomes long and oval.
I	a	"First feathers". First feathers show on side under ideal field conditions. Stays in this class until side view shows one-half of side and flank feathered.
tly thered viewed n the o.	b	"Mostly feathered". Side view shows one-half of side and flank feathered. Primaries break from sheaths. Stays in this class until side view shows down in one or two areas only (nape, back or upper rump).
	c	"Last down". Side view shows down in one or two areas only (nape, back or upper rump). Sheaths visible on erupted primaries through this class. Stays in this class until profile shows no down.
II ly thered profile		"Feathered-flightless". No down visible. Primaries completely out of sheaths but not fully developed. Stays in this class until capable of flight.

Figure I

Appearance of Young at Beginning Point of Each Plumage Subclass*



*Class I: Eyeline in dabblers only (except baldpate)

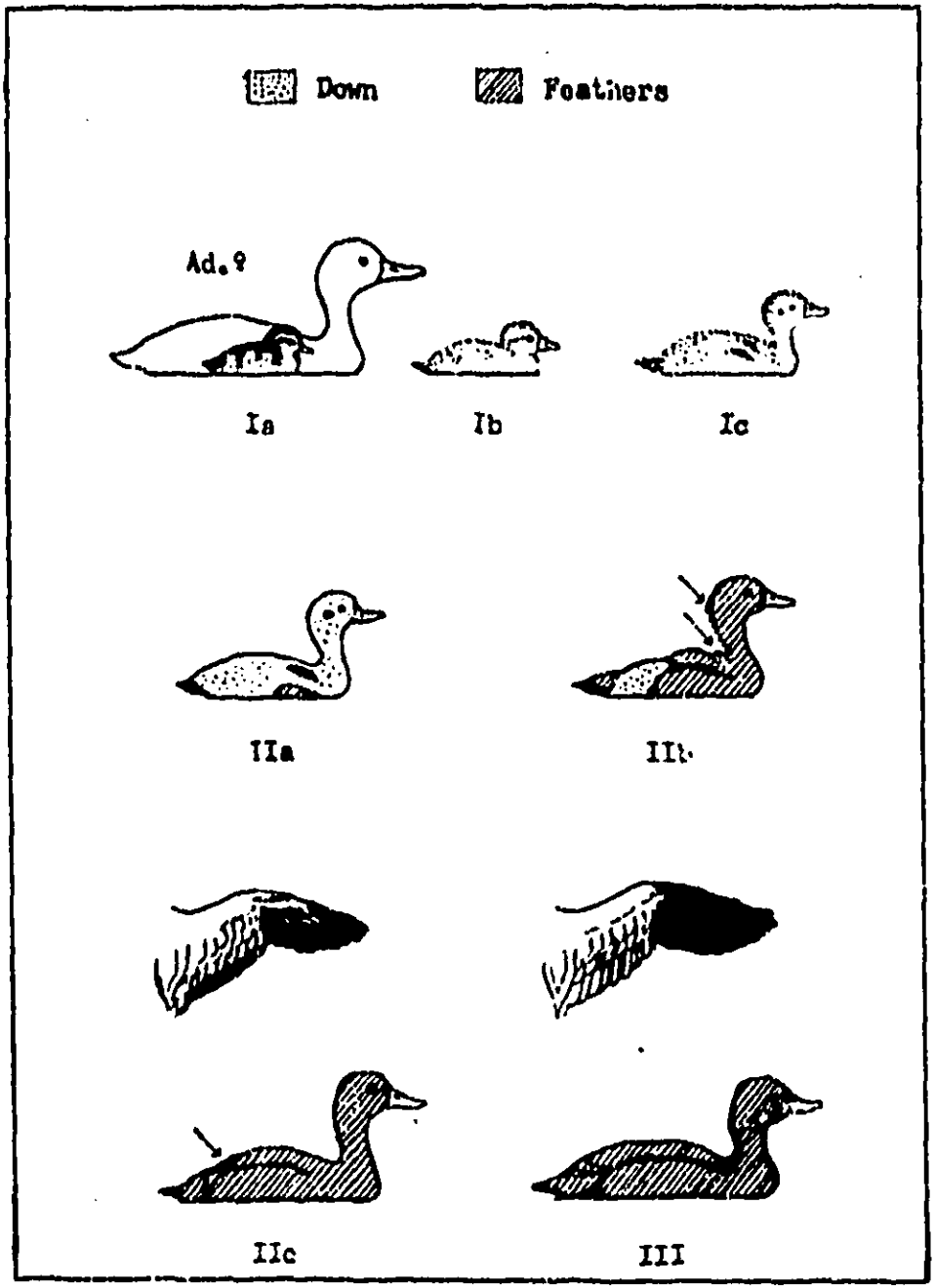
Plumage Class	S C
I	
Downy Young No Feathers visible	
II	
Partly Feathered as viewed from the side.	
III Fully Feathered in profil	

Table I - Development of a Wild Duckling as Viewed Under Ideal Conditions

Plumage Class	Sub-Class	Description
I	a	"Bright ball of fluff". Down bright. Patterns distinct (except diving ducks). Body rounded; neck and tail are not prominent.
Downy Young No feathers visible	b	"Fading ball of fluff". Down colour fading, patterns less distinct. Body still rounded; neck and tail are not yet prominent.
	c	"Gawky-downy". Down colour and patterns faded. Neck and tail becomes prominent. Body itself becomes long and oval.
II	a	"First feathers". First feathers show on side under ideal field conditions. Stays in this class until side view shows one-half of side and flank feathered.
Partly Feathered as viewed from the side.	b	"Mostly feathered". Side view shows one-half of side and flank feathered. Primaries break from sheaths. Stays in this class until side view shows down in one or two areas only (nape, back or upper rump).
	c	"Last down". Side view shows down in one or two areas only (nape, back or upper rump). Sheaths visible on grunted primaries through this class. Stays in this class until profile shows no down.
III Fully Feathered in profile		"Feathered-flightless". No down visible. Primaries completely out of sheaths but not fully developed. Stays in this class until capable of flight.

Figure I

Appearance of Young at Beginning Point of Each Plumage Subclass*



*Class I: Eyeline in dabblers only (except baldpate)

Table II - Approximate Age Span (in days) For Each Plumage Subclass by Species

	Ia	Ib	Ic	IIa	IIb	IIc	III	Flying
Mallard	1- 6	7-12	13-18	19-25	26-35	36-45	46-55	52-60
Black Duck	1- 5	6-12	13-18	19-25	26-33	34-43	44-60	58-63
Gadwall	1- 6	7-14	15-18	19-27	28-38	39-44	45-50	48-52
Baldpate	1- 7	8-12	13-18	19-26	27-35	36-41	42-50	47+
Pintail	1- 5	6-12	13-18	19-23	24-33	34-43	44-51	46-57
Blue-wgd Teal	1- 5	6- 9	10-13	14-21	22-30	31-36	37-40	35-44
Shoveller	1- 6	7-13	14-17	18-27	28-35	36-44	45-50	47-54
Redhead	1- 6	7-18	19-24	25-32	33-45	46-54	55-60	60-63
Ring-neck	1- 5	6-10	11-16	17-24	25-30	31-38	39-49	49-53
Canvasback	1- 9	10-17	18-23	24-29	30-40	41-50	51-60	57-68
Lesser Scaup	1- 6	7-13	14-20	21-28	29-33	34-42	43-50	47+

Table III - Approximate Midpoint Age (in days) of Each Subclass and Supplementary Data

	Ia	Ib	Ic	IIa	IIb	IIc	III	Primaries Break From Sheaths	Areas of Last Visible Down
Mallard	4	10	16	22	31	41	51	35	Rump
Black Duck	3	9	16	22	30	39	52	--	--
Gadwall	4	11	17	23	33	42	48	31	Nape and Back
Baldpate	4	10	16	23	31	39	46	30	Nape and Rump
Pintail	3	9	16	21	29	39	48	31	Back
Blue-wgd Teal	3	8	12	18	26	34	39	30	Nape and Rump
Shoveller	4	10	16	23	32	40	48	33	Nape and Back
Redhead	4	13	22	29	39	50	58	43	Rump and Back
Ring-neck	3	8	14	21	28	35	44	--	--
Canvasback	5	14	21	27	35	46	56	40	Rump and Back
Lesser Scaup	3	10	17	25	31	38	47	--	--

plementary Data

Areas of Last Visible Down
Rump
--
Nape and Back
Nape and Rump
Back
Nape and Rump
Nape and Back
Rump and Back
--
Rump and Back
--

Table II - Approximate Age Span (in days) For Each Plumage Subclass by Species

	Ia	Ib	Ic	IIa	IIb	IIc	III	Flying
Mallard	1- 6	7-12	13-18	19-25	26-35	36-45	46-55	52-60
Black Duck	1- 5	6-12	13-18	19-25	26-33	34-43	44-60	58-63
Gadwall	1- 6	7-14	15-18	19-27	28-38	39-44	45-50	48-52
Baldpate	1- 7	8-12	13-18	19-26	27-35	36-41	42-50	47+
Pintail	1- 5	6-12	13-18	19-23	24-33	34-43	44-51	46-57
Blue-wgd Teal	1- 5	6- 9	10-13	14-21	22-30	31-36	37-40	35-44
Shoveller	1- 6	7-13	14-17	18-27	28-35	36-44	45-50	47-54
Redhead	1- 6	7-18	19-24	25-32	33-45	46-54	55-60	60-63
Ring-neck	1- 5	6-10	11-16	17-24	25-30	31-38	39-49	49-53
Canvasback	1- 9	10-17	18-23	24-29	30-40	41-50	51-60	57+68
Lesser Scaup	1- 6	7-13	14-20	21-28	29-33	34-42	43-50	47+

Table III - Approximate Midpoint Age (in days) of Each Subclass and Supplementary Data

	Ir	Ib	Ic	IIa	IIb	IIc	III	Primaries Break From Sheaths	Areas of Last Visible Down
Mallard	4	10	16	22	31	41	51	35	Rump
Black Duck	3	9	16	22	30	39	52	--	--
Gadwall	4	11	17	23	33	42	48	31	Nape and Back
Baldpate	4	10	16	23	31	39	46	30	Nape and Rump
Pintail	3	9	16	21	29	39	48	31	Back
Blue-wing Teal	3	8	12	18	26	34	39	30	Nape and Rump
Shoveller	4	10	16	23	32	40	48	33	Nape and Back
Redhead	4	13	22	29	39	50	58	43	Rump and Back
Ring-neck	3	8	14	21	28	35	44	--	--
Canvasback	5	14	21	27	35	46	56	40	Rump and Back
Lesser Scaup	3	10	17	25	31	38	47	--	--

was necessary would depend on the number of potential later broods indicated on the second count, i.e., the number of pairs, lone drakes and single hens, assumed to be nesting or about to nest. Coverages should be continued until these breeding units are few in number, preferably nil, because their treatment in the calculation of production requires further investigation.

The third condition - avoiding duplication - requires that a large proportion of the broods seen be recorded by plumage subclass. However, most censuses will result in some broods being unclassified as to species, plumage subclass (including broody hens) or both. By assuming that the species and plumage subclass distribution of the classified portion of the population is the same for the unclassified portion, these unknowns can and should be converted in order to calculate production. This is done by determining the species and plumage subclass percentages for classified broods and applying these figures to the unclassified broods. If the latter are few in number this conversion can sometimes be made by a simple inspection of the determined broods.

Once the above corrections have been applied and the data from each survey have been summarized by species and plumage subclass, duplicate counts are eliminated as follows: 1) count all broods seen on the first survey, and 2) add to these only those broods recorded on subsequent coverages whose subclass shows they had hatched since the previous coverage. This results in the elimination of all broods on subsequent surveys that were old enough to have been counted on a previous survey. This is done by using the data in Table III which gives the average, or midpoint, age for each plumage subclass by species. If the interval between two coverages was 28 days, then all broods in plumage subclasses with a midpoint age of 29 days or older would be eliminated from the second count and those remaining would be added to the previous count to give the total number of broods to be used in production calculations. The question of brood movements onto and from an area requires further investigation for accurate censusing.

Table IV demonstrates the procedure to be followed once all unclassified broods have been converted as indicated above. Broods that were eliminated on each count because their plumage subclass indicated that they were old enough to be counted in the previous coverage have been starred. Flying birds have been omitted from the data. The June 1 census was not needed because none of the broods seen then were flying on June 29. On July 27, four potential later teal broods were noted (1 pair and 3 lone drakes); these made up about 8% of the actual teal broods already tallied. Whether or not a later census should be run to obtain complete data on such broods will have to be decided by the circumstances of each case.

Other uses for production data were given in the 1953 bulletin. It should be pointed out, however, that a hatching curve calculated from aged broods is not, by itself, a measure of the intensity of the overall nesting effort of a species. Rather, it is a measure of the intensity of the successful nesting effort since it does not take into account the unsuccessful nests of eventually successful hens nor the nests of hens that never were successful in bringing off a brood.

As stated in the introduction, present emphasis is on the brood for determining production; censusing and aging are the principal tools used. Another method of attacking this complex phase of population dynamics is through intensive nesting studies (including marked hens), wherein the factors influencing initial nests, nest destruction and renesting (the net result of these being the brood hatching curve) are determined by habitat and species over a period of years. Once this is done and the results, supplemented by hatching curves based on aged broods, are compared with weather phenomena, a correlation might allow for an estimation of production over large areas based on the breeding population and climatic factors.

Table IV - Example of Calculating Production From Four-Week Censuses.

Date	Species	Broods By Age Classes							New Broods
		Ia	Ib	Ic	IIa	IIb	IIc	III	
June 1	Mall.	9	6	2					17
	Pin.	14	7	4					25
June 29	Mall.	10	11	7	9	9*	8*		37
	Pin.	6	12	10	13	14*	7*	4*	43
	Teal	9	8	6	2	2			27
July 27	Mall.	1	2	4	6	10*	18*	9*	13
	Pin.			3	4	8*	12*	23*	7
	Teal	2	4	5	4	7	13*	10*	22
Potential Later Broods		1 pair and 3 lone drake teal.							

* Shows broods eliminated.

Calculated Production:

Mallard: 67 broods.
Pintail: 75 broods.
Teal: 49 broods plus 4 potential broods.

Literature Cited

(1) Blankenship, L. H. Use of duckling ages for studies on waterfowl populations and production on prairie stock ponds in western South Dakota. Master of Science Thesis, University of Minnesota. 1952.

(2) Blankenship, L. H., et al. Techniques for brood production studies. A special report for the Mississippi Flyway Council Technical Committee. Edited by W. H. Marshall, 14 p. mimeo. 1953.

(3) Evans, C. D., A. S. Hawkins and W. H. Marshall. Movements of waterfowl broods in Manitoba. U.S.D.I. Fish and Wildlife Service Special Scientific Report: Wildlife No. 16. 1952

(4) Hochbaum, H. A. The canvasback on a prairie marsh. The American Wildlife Institute, Washington D.C. 1944.

(5) Miller, A. W., and B. D. Collins. A nesting study of ducks and coots on Tule Lake and Lower Klamath National Wildlife Refuges. Calif. Fish and Game 40(1):17-37. 1954

(6) Southwick, C. A system of age classification for field studies of waterfowl broods. Jour. Wildl. Mgt. 17(1):1-8. 1953.

(7) Stoudt, J. H. The number of waterfowl and the kill on the Chippewa National Forest, 1937. Jour. Wildl. Mgt. 2(3):82-93. 1938.

Appendix

Ray Hurdy of South Dakota sent in an ingenious suggestion of a "slide rule" for handling large series of aged brood data as follows:

The rule consists of two parts. One is a linear calendar which covers the period from the date the earliest brood is hatched through the date the latest brood attains flight. Each date on this linear calendar is represented by a ¼-inch wide space.

The second part is a set of sliding strips, one for each species. In the center of each strip is an indicator that represents the date of observation. To the left of this indicator is a series of arrows which represents the plumage subclasses from Ia through III. The distance from each of these arrows to the observation date indicator is equal to the mid-point age in days of the corresponding plumage sub[illegible] allowing a ¼-inch space for each day.

To the right of the observation date indicator is a similar series of arrows which also represents the seven plumage subclasses. But, in this series, the distance from the observation date indicator to each of the arrows is equal to the number of days difference between the midpoint age of the plumage subclass and the age at which the species attains the power of flight.

To convert plumage subclasses to estimates of hatching or flight dates we deal with each species separately. The sliding scale for a particular species is placed on the calendar with the observation date indicator on the date on which the brood was observed. The proper arrow to the left (i.e., Ia, Ib, etc., depending on the plumage subclass of the brood at the time of observation) indicates the estimated hatching date on the calendar. Similarly, the proper arrow to the right indicates the estimated date on which the brood attained the power of flight.